5/prts



# DESCRIPTION

## A REINFORCING HOLDER AGAINST VIBRATIONS

### Technical Field

The present invention relates to a reinforcing holder against vibrations mounted on the joining part of structural members such as foundations, columns, beams and cross-beams or the like to reinforce them so that a wooden building may not be broken down even if strong vibrations are loaded by an earthquake, a typhoon or the like.

### Background Art

So far, as methods of reinforcing the joining part of structural members of a wooden building, there have been various methods employed: providing bracings or horizontal braces, or mounting clamps or L-shaped metal fittings.

However, in such conventional methods as described above, no sufficient reinforcing effect can be obtained in a case where strong vibrations are loaded by an earthquake, a typhoon or the like, and the structural members tend to be easily disjoined or sustain damage in the joining parts so that wooden buildings sometime may break in the joining parts, or in a severe case, the buildings may fall down.

Sb3 In view of the foregoing, the reinforcing holder against vibrations 41 shown in the perspective view of FIG. 5 has been devised and used to sufficiently withstand even strong vibrations caused by an earthquake, a typhoon or the like.

The reinforcing holder against vibrations 41 comprises an L-shaped base member 42 formed by bending a plate formed of high tension steel in the form of an L-shape and formed with bent and swelled parts 43a and 43b bent inward in intermediate parts of both piece parts 42a and 42b, a reinforcing member 44 formed by bending a plate formed of high tension steel and fixedly mounted by welding on a bent corner part 42c of the L-shaped base member 42, and absorbing members 45 formed of shock-absorbing rubber or the like stopped at several locations of the L-shaped base member 42.

According to the above-mentioned arrangement, both vertical and horizontal strong vibrations can be absorbed by the whole L-shaped base member 42 and its bent and swelled parts 43a and 43b, and deformation of the L-shaped base member 42 can be removed and the original shape thereof can be restored. Therefore, even if strong vibrations are loaded, a wooden building may not easily break in the joining parts or may not easily fall down.

However, since the above-mentioned reinforcing holder against vibrations 41 is provided with the L-shaped base member 42, there is a limitation that the reinforcing holder needs to be mounted, for its structural reasons, with the both piece parts of the L-shaped base member 42 being attached astride on the same inner surface sides of the structural members crossed at right angles. Therefore, for instance, in a case where another structural member exists between the structural members to be joined, another structural member comes to be an obstacle and there is the inconvenience of incapacitating the reinforcing holder against vibrations 41 for being mounted.

Further, since the reinforcing member 44 is fixedly mounted by welding on the L-shaped base member 42, and the bent corner part

42c of the L-shaped base member 42 and the bent corner part 44c of the reinforcing member 44 are placed in close contact, the amount of elastic deformation is small, and the effect of removing the deformation of the L-shaped base member 42 and restoring the original shape thereof is also insufficient.

Disclosure of Invention

The present invention is accomplished to solve such problems as noted above with respect to prior art. It is an object of the present invention to provide a reinforcing holder against vibrations with enhanced absorption of vertical and horizontal vibrations and vertical oscillations and enhanced vibration-proof performance so that a wooden building may not fall down even if strong vibrations caused by an earthquake, a typhoon or the like are loaded thereupon.

The present invention is intended to solve the problems and achieve the aforementioned object by providing the reinforcing holder against vibrations comprising a reinforcing base member formed by twisting and bending both end parts of a plate in one direction to form fixing piece parts and absorbing members with rubber elasticity, characterized in that the reinforcing base member is fixed to structural members via the absorbing members.

In the reinforcing holder against vibrations, a bent and swelled part is formed by bending twice outward the intermediate part of the reinforcing base member or a curved and swelled part is formed by curving outward the intermediate part and, preferably, a cushion round is formed in an approximate center part of the bent and swelled part or the curved and swelled part.

It is more preferable that the plate is formed of high tension

steel, since it is excellent in tensile strength, weldability, notch toughness, workability and corrosion resistance.

Brief Description of Drawings

FIG. 1 is a perspective view of an embodiment of the present invention. FIG. 2 is a perspective view of an embodiment of the present invention mounted on the structural members. FIG. 3 is a sectional view of the embodiment cut along arrows X-X shown in FIG. 2. FIG. 4 is a perspective view of another embodiment of the present invention. FIG. 5 is a partially perspective view of a twisted and bent corner of a fixing piece formed in the reinforcing base member of the present invention. FIG. 6 is a perspective view of a conventional reinforcing holder against vibrations.

Best Mode for Carrying out the Invention

Preferred embodiments of the reinforcing holder against vibrations according to the present invention will be described concretely hereinafter based upon the drawings.

FIG. 1 is a perspective view of an embodiment of the present invention, FIG. 2 is a perspective view of an embodiment of the present invention mounted on the structural members, FIG. 3 is a sectional view of the embodiment cut along arrows X-X shown in FIG. 2, FIG. 4 is a perspective view of another embodiment of the present invention and FIG. 5 is a partially perspective view of a twisted and bent corner of a fixing piece formed in the reinforcing base member of the present invention.

As shown in perspective views of FIGs. 1, 2 and 4, the

reinforcing holder against vibrations according to the present invention comprises a reinforcing base member 1 formed by twisting and bending both end parts of a plate in one direction to form fixing pieces 11, 11 and absorbing members 2 with rubber elasticity, and is characterized in that the reinforcing base member 1 is fixed to structural members A via the absorbing members 2. The reinforcing holder against vibrations is also characterized in that the reinforcing base member 1 is bent twice outward in the intermediate part 12 to form a bent and swelled part 13 having a plane face or is curved outward in the intermediate part 12 to form a curved and swelled part 14. Preferably, a cushion round 15 is formed in the approximate center part of the intermediate part 12 of the reinforcing base member 1.

According to the present invention, the absorbing members 2 are securely fixed on the reinforcing base member 1, and the bent and swelled part 13 or the curved and swelled part 14 is formed outside of the intermediate part 13 of the reinforcing base member 1, wherefore vertical and horizontal vibrations and vertical oscillations can be absorbed, and the restoring performance can be enhanced so that the resistance to inclinations and torsions can be enhanced even if strong vibrations caused by an earthquake, a typhoon or the like are loaded upon the wooden building. Further, if the cushion round 15 is formed in the approximate center part of the intermediate part 12 of the bent and swelled part 13 or the curved and swelled part 14, vibration-proof performance can be much more enhanced owing to the absorbing effect thereof.

Further, as shown in FIG. 2, even if another structural member B exists between the structural members A to be jointed, the reinforcing holder against vibrations can be mounted on the

structural members avoiding the said another structural member B, wherefore the reinforcing holder against vibrations is so convenient as to be mountable on such parts that a conventional reinforcing holder against vibrations cannot be mounted on.

The reinforcing holder against vibrations of the present invention comprises a reinforcing base member 1 and absorbing members 2. The reinforcing base member 1 is formed preferably of a plate with a thickness of 5 mm formed of iron and steel material with both flexibility and strength, and both end parts thereof are twisted and bent in one direction to form fixing pieces 11 and 11 having edge pieces 17 and 17, as shown in FIGs. 1 and 4.

Preferably, construction steel is employed for iron and steel material, and particularly preferably, high tension steel is employed. High tension steel is obtained by adding to low carbon steel a small quantity of a suitable combination of alloy elements such as manganese, silicon, nickel, chrome, molybdenum and generally has tensile strength of not less than 50 $kg/mm^2$ and yield point of not less than 30 $kg/mm^2$ and is excellent in tensile strength, weldability, notch toughness, workability and corrosion resistance.

With regard to the twisted and bent corners of the fixing pieces 11 and 11 formed on both end parts of the plate, as shown in the partially perspective view of FIG. 5, since the reinforcing base member 1 needs to be fixed along side surfaces of structural members A showing the cross-sectional shape of a square column and the angle $\theta$ -1 viewed from the direction of the arrow x should be set at 90° , whereas the angle $\theta$ -2 viewed from the direction of the arrow y in bent corner parts of the fixing pieces 11 and 11 should be set properly according to the angle at which the reinforcing holder against vibrations is mounted on the structural member A.

The fixing pieces 11 and 11 are provided with fixing holes 16 through which fixing members 3 such as screws, nails or the like are fixed to the structural members A such as foundations, columns, beams and cross-beams via the absorbing members 2.

In the reinforcing base member 1, the bent and swelled part 13 having plane face 131 is formed by bending twice outward the intermediate part 12 as shown in FIG. 1, or the curved and swelled part 14 having curved face 141 is formed by curving outward the intermediate part 12 as shown in FIG. 4.

Preferably, the approximate center part of the bent and swelled part 13 or the curved and swelled part 14 can be swelled inward or outward in the shape of an Ω to form the cushion round 15 to enhance the absorbing effect.

The absorbing members 2 mounted on the contact parts 11 and 11 of the reinforcing base member 1 are formed of shock-absorbing rubber having rubber elasticity with excellent elastic characteristics and durability. As shown in FIG. 3, a contact surface 22 contacting the structural member A is provided on the back side of the absorbing member, and holding parts 23 holding the fixing piece 11 of the reinforcing base member 1 are provided on the front side thereof, and an adjusting hole 21 is bored in the central part of the absorbing member, enabling fine adjustment of the position of the reinforcing base member 1 mounted.

The process of mounting the reinforcing holders against vibrations of the present invention will be described hereunder.

As shown in FIG. 2, in the fixing pieces 11 and 11 of the two reinforcing base members 1 and 1, the absorbing members 2 are attached to a part of the fixing piece 11 to be fixed to the beam member A-1 of the structural member A and to a part of the fixing

piece 11 to be fixed to the column member A-2 of the structural member A in advance. After the lower fixing piece 11 of one reinforcing base member 1 is fixed to the beam member A-1 with the use of the fixing member 3 via the absorbing member 2, the upper fixing piece 11 thereof is touched to a first face a1 and a second face a2 of the column member A-2 and is fixed thereto with the use of the fixing member 3 via the absorbing member 2.

Subsequently, after the lower fixing piece 11 of the other reinforcing base member 1 is fixed to the beam member A-1 with the use of the fixing member 3 via the absorbing member 2, the upper fixing piece 11 thereof is touched to a third face a3 and a fourth face a4 of the column member A-2 and is fixed thereto with the use of the fixing member 3 via the absorbing member 2 attached to the edge piece 17 of the fixing piece 11. In this manner, the beam member A-1 and the column member A-2 of the structural member A can be firmly jointed.

Both of the reinforcing base members 1 can join the beam member A-1 and the column member A-2 firmly avoiding another structural member B.

In the above-mentioned embodiment, the reinforcing holder against vibrations of the present invention is described as to the case where the beam member A-1 is joined with the column member A-2 of the structural members A. However, the usage of the reinforcing holder against vibrations is not limited to the case and the reinforcing holder against vibrations can also be used effectively to join a column member with a cross-beam member and to join a beam member with a cross-beam member or the like.

So far, for instance, as shown in FIG. 2, in the case where another structural member B exists between the beam member A-1

and the column member A-2 of the structural members A, there has been the inconvenience of incapacitating reinforcing holders against vibrations for being mounted. According to the present invention, the inconvenience mentioned above can be avoided. Further, by providing the bent and swelled part 13, the curved and swelled part 14, or the cushion round 15 formed in the reinforcing base member 1 and the absorbing members 2 with rubber elasticity existing between the structural members A and the reinforcing base member 1, vertical and horizontal vibrations and vertical oscillations applied to the structural members A can be absorbed and the restoring performance can be enhanced. Therefore, resistance to inclinations and torsions can be enhanced accordingly even if strong vibrations caused by an earthquake, a typhoon and the like are loaded upon a wooden building, and the action and effect that the vibration-proof performance can be much more enhanced is obtained.

The present invention comprising the above-mentioned construction has the following effects.

According to the present invention, vertical and horizontal vibrations and vertical oscillations can be absorbed and restoring performance can be enhanced, wherefore resistance to inclinations and torsions can be enhanced accordingly even if strong vibrations caused by an earthquake or the like are loaded upon a wooden building, and the action and effect that the vibration-proof performance can be much more enhanced is obtained. Further, even if another structural member is disposed between the structural members to be jointed, the reinforcing holders against vibrations of the present invention is so remarkably convenient and useful as to be mounted avoiding another structural member.